

An L-band Vector Vortex Coronagraph for NACO: the AGPM Project

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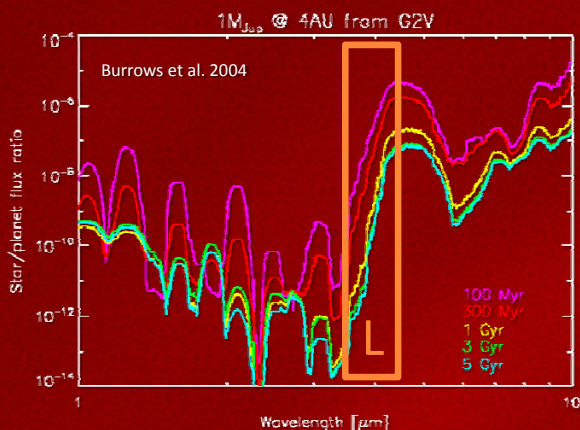
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Why the L band?

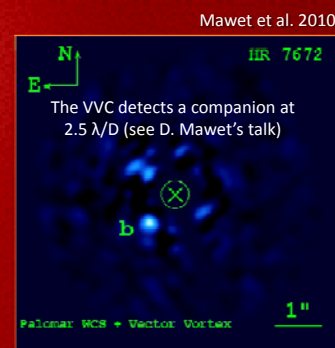


- Planet/star ratio much more favourable than in near-IR
 - See e.g. detection of β Pic b (Lagrange et al. 2010)
- Strehl ratio increases as $\lambda^{6/5}$
 - As high as 70-80% in L band on AO-assisted 10-m class telescope
- Background is still OK
 - L=17 in 1 hour \rightarrow 10 Myr old 1 M_{Jup} planet reachable at 30 pc

BUT ... Lower angular resolution



Need an L-band coronagraph with
a small Inner Working Angle
on a 10-m class telescope



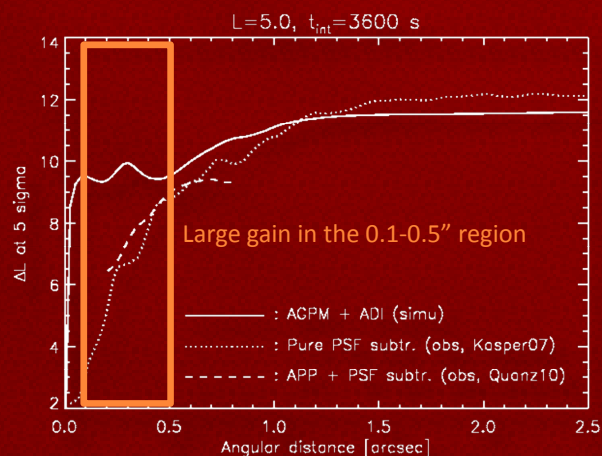
The NACO-AGPM project



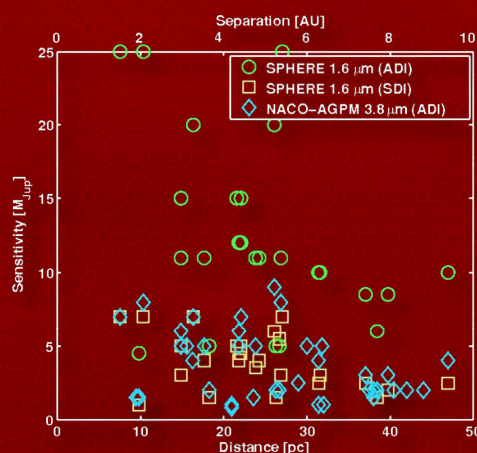
Mawet et al. 2005

- The NAOS-CONICA (NACO) instrument at VLT
 - The sole 10-m class AO-assisted L-band camera in the Southern hemisphere
- The Annular Groove Phase Mask (AGPM) coronagraph
 - Vector vortex coronagraph (VVC, see D. Mawet's poster)
 - Made of zero-order (sub-lambda) grating (ZOG)
 - 360° discovery space down to 1 λ/D
- Manufacturing (see C. Delacroix's talk)
 - Transparent substrate in L-band \rightarrow diamond
 - Etching of the grating with dry plasma at Ångström Laboratory

End-to-end simulations of NACO-AGPM



Estimated sensitivity in Jupiter masses at 0.2''



- E.g. young K and M dwarfs
 - From 8 to 200 Myr, $d < 50$ pc
- NACO: near-IR WFS
 - $K < 9 \rightarrow 40$ targets
 - Pupil tracking, 10 mas rms pointing, ADI (angle $> 45^\circ$)
- SPHERE: visible WFS
 - $V < 10 \rightarrow 25$ targets
- Excellent complementarity
 - L-band NACO-AGPM could be as good as H-band SPHERE at 0.2'', provided that AGPM is to specs